

CLAIMS

What is claimed is:

- 1 1. A system that allows a table and a materialized view to be available
2 while the materialized view is being refreshed, the system comprising:
3 a materialized view that is derived at least in part from a table;
4 a refresh log that contains a plurality of entries, each of the plurality of
5 entries corresponding to a change in the table, each of the plurality
6 of entries comprising an epoch identifier; and
7 a refresh manager that performs a refresh operation on the materialized
8 view in multiple steps by (a) successively reading a first subset of
9 the plurality of entries indicated by a specific epoch identifier from
10 the refresh log, (b) identifying a second subset of the plurality of
11 entries from within the first subset of the plurality of entries, the
12 second subset of the plurality of entries falling within a primary key
13 value boundary and (c) applying the second subset of the plurality
14 of entries to the materialized view.

- 1 2. The system set forth in claim 1, wherein the corresponding epoch
2 identifiers represent epoch numbers that have been created since a previous refresh
3 operation on the materialized view.

1 3. The system set forth in claim 1, wherein the second subset of the
2 plurality of entries is applied to the materialized view in a primary key order.

1 4. The system set forth in claim 1, wherein the refresh manager is
2 adapted to distinguish between entries of the second subset of the plurality of
3 entries that have already been applied to the materialized view in previous
4 transactions and entries of the second subset of the plurality of entries that have not
5 been applied to the materialized view in the event of a failure of the refresh
6 operation.

1 5. A method of refreshing a materialized view that is in part derived
2 from a table, the method being adapted to improve the availability of the table and
3 the materialized view while the materialized view is being refreshed, the method
4 comprising:
5 deriving a materialized view from at least one table;
6 assigning an epoch identifier to changes made to the at least one table;
7 storing an entry corresponding to each change to the at least one table in a
8 refresh log that includes a plurality of entries, each of the plurality
9 of entries comprising an epoch identifier; and
10 performing a refresh operation in multiple operations, each of the multiple
11 operations comprising (a) successively reading a first subset of the
12 plurality of entries indicated by a specific epoch identifier from the

13 refresh log, (b) identifying a second subset of the plurality of entries
 14 from within the first subset of the plurality of entries, the second
 15 subset of the plurality of entries falling within a primary key value
 16 boundary and (c) applying the second subset of the plurality of
 17 entries to the materialized view..

1 6. The method set forth in claim 5, comprising applying the second
 2 subset of the plurality of entries to the materialized view in a primary key order.

1 7. The method set forth in claim 5, comprising defining the epoch
 2 identifier to correspond to changes that have been made to the table since a
 3 previous refresh operation on the materialized view.

1 8. The method set forth in claim 5, comprising distinguishing between
 2 entries of the second subset of the plurality of entries that have already been
 3 applied to the materialized view in previous transactions and entries of the second
 4 subset of the plurality of entries that have not been applied to the materialized view
 5 in the event of a failure of the refresh operation.

1 9. A system that provides availability of a table and a materialized
2 view while the materialized view is being refreshed, the table being derived at least
3 in part from the materialized view, the system comprising:
4 a refresh log that contains a plurality of entries; and
5 a refresh manager that computes a table delta based on the refresh log and
6 applies the table delta to the materialized view.

1 10. The system set forth in claim 9, wherein each of the plurality of
2 entries comprises an epoch identifier.

1 11. The system set forth in claim 10, wherein the epoch identifier
2 corresponds to changes that have been made to the table since a previous refresh
3 operation on the materialized view.

1 12. The system set forth in claim 9, wherein the table delta is applied to
2 the materialized view in a primary key order.

1 13. The system set forth in claim 9, wherein the table delta is used to
2 refresh the materialized view in multiple transactions.

1 14. The system set forth in claim 9, wherein a primary key value for
2 each entry from the refresh log is recorded after that entry is applied to the
3 materialized view.

1 15. The system for refreshing the materialized view set forth in claim 9,
2 wherein the refresh manager is adapted to distinguish between a first subset of the
3 plurality of entries that have already been applied to the materialized view in
4 previous transactions and a second subset of the plurality of entries that have not
5 been applied to the materialized view in the event of a failure of the refresh
6 operation.

1 16. A method of refreshing a materialized view that is derived at least
2 in part from a table, the method being adapted to provide availability of the table
3 and the materialized view while the materialized view is being refreshed, the
4 method comprising the acts of:
5 storing a plurality of entries corresponding to changes in the table in a
6 refresh log;
7 computing a table delta based on the refresh log;
8 refreshing the materialized view based on the table delta.

1 17. The method set forth in claim 16, wherein the table delta is applied
2 to the materialized view in a primary key order.

1 18. The method set forth in claim 16, comprising updating the
2 materialized view in multiple transactions.

1 19. The method set forth in claim 16, comprising storing an epoch
2 identifier as a portion of each of the plurality of entries.

1 20. The method set forth in claim 19, comprising defining the epoch
2 identifier to correspond to changes that have been made to the table since a
3 previous refresh operation on the materialized view.

1 21. The method set forth in claim 16, comprising recording the primary
2 key value for each entry from the update log after that entry is applied to the
3 materialized view.

1 22. The method set forth in claim 16, comprising distinguishing
2 between a first subset of the plurality of entries that have already been applied to
3 the materialized view in previous transactions and a second subset of the plurality

4 of entries that have not been applied to the materialized view in the event of a
5 failure of the act of refreshing the materialized view.

1 23. A system that provides availability of a table and a materialized
2 view while the materialized view is being refreshed, the table being derived at least
3 in part from the materialized view, the system comprising:
4 a refresh log that contains a plurality of entries; and
5 means for computing a table delta based on the refresh log; and
6 means for applying the contents of the table delta to the materialized view.

1 24. The system set forth in claim 23, wherein each of the plurality of
2 entries comprises an epoch identifier.

1 25. The system set forth in claim 24, wherein the epoch identifier
2 corresponds to changes that have been made to the table since a previous refresh
3 operation on the materialized view.

1 26. The system set forth in claim 23, wherein the means for applying
2 the table delta to the materialized view is adapted to distinguish between a first
3 subset of the plurality of entries that have already been applied to the materialized
4 view in previous transactions and a second subset of the plurality of entries that

5 have not been applied to the materialized view in the event of a failure of applying
6 the table delta to the materialized view.

1 27. A computer program, comprising:
2 a machine readable medium;
3 a refresh log stored on the machine readable medium, the refresh log
4 containing a plurality of entries; and
5 a refresh manager stored on the machine readable medium, the refresh
6 manager being adapted to refresh a materialized view that is derived
7 at least in part from a table by computing a table delta based on the
8 refresh log and applying the table delta to the materialized view.

1 28. The computer program set forth in claim 27, wherein each of the
2 plurality of entries comprises an epoch identifier.

1 29. The computer program set forth in claim 28, wherein the epoch
2 identifier corresponds to changes that have been made to the table since a previous
3 refresh operation on the materialized view.

1 30. The computer program set forth in claim 27, wherein the refresh
2 manager is adapted to distinguish between a first subset of the plurality of entries

- 3 that have already been applied to the materialized view in previous transactions
- 4 and a second subset of the plurality of entries that have not been applied to the
- 5 materialized view in the event of a failure of a refresh operation.